

The role of bacterial immune systems in the spread of antimicrobial resistance

Supervisory team:

Main supervisor: Prof Edze Westra (University of Exeter)

Second supervisor: Prof Mark Szczelkun (University of Bristol)

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Collaborators: Dr Fernanda Paganelli (University of Utrecht), Prof Rob Willems (University of Utrecht)

Host institution: University of Exeter (Penryn)

Project description:

Antimicrobial resistance is one of the greatest threats to human health of our time causing a predicted 10 million deaths per year by 2050 with a total cost of \$100 trillion by the same date.

Novel resistance mechanisms regularly emerge in clinical pathogens, which threatens to make even our antibiotics of last resort ineffective. It has been postulated that we are entering a post-antibiotic era where even simple infections might be fatal, and routine medical procedures that depend of antibiotic prophylaxis will be impossible.

Antimicrobial resistance mechanisms are often carried on plasmids, which are mobile DNA elements that can spread by horizontal gene transfer between bacteria, leading to rapid spread of resistance between species. Understanding how these plasmids spread is critical to future efforts to manage the dissemination of antimicrobial resistance.

This project will explore to what extent bacterial immune systems can limit the spread of antimicrobial resistance to gut bacteria. It is well documented that bacteria can have many different types of immune systems, with clear variation in the number and types of systems between bacteria, but how these systems shape the spread of antimicrobial resistance remains unclear. The integration of research on bacterial immune systems and AMR is highly novel and is supported by established and well-funded research programmes in Westra's, van Houte's and Szczelkun's research teams at the Universities of Exeter and Bristol. The project will combine state-of-the-art experimental and metagenomics approaches, which will be complemented with modelling under supervision of Ben Ashby at the University of Bath.

The student will be part of a thriving and well-funded research team at the Environment and Sustainability Institute of the University of Exeter. For more information on the team, see <https://westralab.wordpress.com/>.